Early Flowering Tree Rediscovered

About 100 million years ago, flowering plants burst onto the evolutionary scene and proceeded to become the dominant group of plants on the planet. Their sudden appearance, Charles Darwin wrote, was "an abominable mystery."

Botanists now have a new clue to that mystery. A diminutive tree with button-sized flowers, rediscovered on a remote ridge top in Madagascar, has been identified as the descendant of one of the first flowering plants.

"It's in essence a living fossil," says George E. Schatz of the Missouri Botanical Garden (MBG) in St. Louis. "It can provide insight into a number of issues related to the early evolution of flowering plants."

The rain forest plant has a history of reappearing unexpectedly. It belongs to a family of tropical plants, Winteraceae, that today is common on Pacific islands and can also be found in Central and South America. Yet records of fossilized pollen indicate that the plant became extinct in Africa 30 million years ago.

In 1963, a French botanist found an unidentified museum specimen that had been collected from the island of Madagascar, off the coast of Africa, in 1909. The plant, one of the Winteraceae, was later renamed *Takhtajania perrieri*, after a Russian botanist.

Despite attempts to find others, the specimen remained one of a kind until 1994, when a new inventory of the endangered Madagascan rain forest was conducted. A Malagasy plant collector took some cuttings from a group of trees about 150 kilometers east of the 1909 site and sent the material to MBG.

When Schatz opened the box of material in May this year, he knew immediately it was the long-lost *Takhtajania*. He had happened to examine the 1909 specimen on a trip to Paris a few months earlier. "It was rather fortuitous," says Schatz. "The image was very fresh in my mind."

In June, a second group of Malagasy collectors went back to the ridge top, where they found a large group of the rare trees alive and well. They collected more of the trees' leaves, wood, flowers, and berrylike fruits, which have been sent to researchers around the world.

Molecular biologist Elizabeth A. Zimmer of the Smithsonian Institution's National Museum of Natural History in Washington, D.C., received a package of leaves preserved in silica gel. She and her coworkers have just finished sequencing a segment of DNA extracted from those leaves, completing their molecular analysis of the Winteraceae.

"Preliminary DNA data say it's the oldest thing in that group," says Zimmer. For the gene they examined, *Takhtajania* "is quite different at the DNA level."

It's quite different on other levels as well. "Essentially, just about everything about the plant is primitive," says Schatz.

One striking characteristic is the absence of water-conducting cells in its wood. Almost all flowering plants today have these so-called vessel elements. Vessels enable plants to cope with drought. Before such vessels appeared, plants would have been restricted to moist areas, like the wet understory of the rain forest.

The rediscovery of *Takhtajania* is expected to help researchers understand how a group of organisms made a major leap into a new evolutionary mode—a leap that allowed another group to blossom, the mammals. "It's really exciting," says Zimmer. "An inspiring thing," adds Richard Keating of MBG. *—C. Mlot*


Missouri Botanical Garden

Flowery roots: The small wine-colored flowers and large glossy leaves of the Takhtajania *plant hadn't been seen in the wild for 85 years.*

A protein that helps the body pump iron

To the human body, iron is a metal more precious than gold. Among its vital roles, iron helps form oxygen-carrying hemoglobin molecules in the blood. More than a billion people worldwide suffer from anemia because they have too little iron in their diet. Even in the United States, 1 woman in 10 is anemic.

Despite the metal's importance, scientists have had few clues as to how the body snares iron from food and transfers it into cells.

"The molecular details of iron absorption have eluded investigators for half a century. There have been many reports about one molecule or another serving as an iron transporter, none of which have withstood scrutiny and time," says Philip Aisen of the Albert Einstein College of Medicine in New York.

Now, two research groups have independently homed in on a protein that seems to be the long-sought treasure.

"It looks like this protein is the major iron transporter, both in the intestine and other tissues," says Nancy C. Andrews of the Howard Hughes Medical Institute at Children's Hospital in Boston.

Andrews and her colleagues, who present their work in the August NATURE GENETICS, studied mice with a hereditary form of anemia and found that the disorder stemmed from a mutation in a previously known gene called *Nramp2*.

A second line of evidence implicating the gene, presented by a research team led by Matthias A. Hediger of Brigham and Women's Hospital in Boston, appears in the July 31 NATURE.

These investigators fed rats an iron-poor diet, hoping the animals would compensate by increasing their production of iron transporter proteins. The researchers then isolated the protein-encoding RNA strands from the intestinal cells of the animals and created from the RNA a library of genes. They injected individual genes into frog eggs, placed the eggs into an iron-rich solution, and observed which ones took in large amounts of the metal.

They discovered a single rat gene that endowed the frog eggs with an ability to absorb extra iron. That gene was *Nramp2*. Hediger's team also found that *Nramp2* helps the eggs absorb other metals, such as copper, zinc, and cadmium.

The *Nramp2* gene resembles another gene, *Nramp1*, whose protein plays a crucial role in animals' resistance to bacteria that invade their cells. Like people, bacteria need iron to survive, notes Andrews. *Nramp1*'s protein "may keep iron away from intracellular pathogens," she speculates.

On the other hand, suggests Hediger, this protein may pump iron into infected cells to help produce antibacterial compounds.

While Aisen believes that the two groups have found the long-sought iron transporter, he notes that they haven't determined how it latches onto iron and delivers the metal into cells.

The researchers speculate that drugs or other therapies targeting the iron transporter may help treat anemia or its common counterpart, hemochromatosis, a disease in which the body absorbs too much iron (SN: 1/18/97, p. 46). *—J. Travis*